days; Hochstetter, on the other hand, not exceeding five days; Meade Boulton, from two to three and ten to fourteen days; Wolffhügel and Riedel, thirty-two days. Similarly as regards the vitality of Koch's cholera vibrio in distilled water, Percy Frankland states that none were discoverable on the second day (the vibrio was initially in a weakened condition); Hochstetter, twenty-four hours to seven days; Nicati and Rietch, more than twenty days; Slater, five hours; Strauss and Dubarry, fourteen days. These differences are extremely perplexing and materially interfere with the value of the statements. As all these observers used distilled water, the differences as to the vitality must be due to the microbes themselves; the readiest explanation is this, that the different observers used the microbes in different states of resistance. It is perfectly well known that a variety of conditions, such as the nature of the nutritive medium in which the organisms had been growing, the age and the pedigree of the culture used, determine the resistance and vitality; unless, therefore, in all cases the best and most favourable cultures are used, the observations are of small value, and the authors justly (see pp. 331 and 334) lay stress on similar points.

One conclusion proceeds with clearness from the recorded observations, viz. that (p. 261) "a number of bacteria, possessing pathogenic properties of the most pronounced character, have been detected in natural waters from time to time," and it is therefore not quite correct to assume, as is generally done, that typhoid and cholera are the only diseases whose germs are distributed by water, nor is it justifiable to limit our attention to these two species only, because the whole subject of the identification of specific bacteria in water is practically still in its initial phase.

Chapter ix. and last, on the action of light on micro-organisms, is extremely well written and gives a detailed account of this important and ever-widening field of research; the history of the whole subject and the very valuable results obtained by the authors (or rather "by one of us"[1]) are described in a thorough and readable manner. It is to be regretted that the beautiful and well-known researches of Prof. Marshall Ward on the fundamental difference of action of the red and blue part of the spectrum should have been passed over.

In an appendix a valuable and up-to-date systematic description is given of the micro-organisms that have been hitherto found in water, by which their identification is greatly facilitated. We only wish the authors had not ventured to classify them into pathogenic and non-pathogenic bacteria, the former indicated by being printed in red letters, the latter in black. The authors do not accurately define, for obvious reasons, what is and what is not a pathogenic micro-organism, but give a list of "those microbes which have been found to be pathogenic to man or animals." The classification in the appendix is both incorrect and misleading. It is incorrect because a great many of the microbes mentioned here as non-pathogenic, produce disease and death in the guinea-pig if injected in sufficiently large doses into the peritoneal cavity; it is misleading because microbes are mentioned here as pathogenic, *e.g.* the *Bacillus coli*, the *Proteus vulgaris*, the *Proteus mirabilis*, which have no greater claim to such a designation than the *Bacillus prodigiosus* or the *Bacillus subtilis*; for it has been conclusively established, by a number of independent observers, that these latter act in the same way pathogenetically when injected into the guinea-pig's peritoneum as the *Bacillus coli*, the vibrio of Koch, or the bacillus of typhoid fever.

In conclusion, we have no hesitation in saying that, short of the omissions that we have pointed out, the book will take a prominent place amongst the standard works on micro-organisms in water. E. Klein.

RITTER'S "ASIA," RUSSIAN ADDENDA.

East Siberia. Part i., *being the Sayan Highlands in the Government of Irkutsk, in the South of the great Siberian Highway, up to the South-western Extremity of Lake Baikal.* By P. P. Semenoff, I. D. Chersky, and G. G. von Petz. (St. Petersburg, 1894.)

This volume belongs to the great undertaking of the Russian Geographical Society, which was begun many years ago with the intention of publishing addenda to those parts of Ritter's "Asia" which deal with regions of the great continent belonging to Russia, or touching its frontiers. The large number of geographical researches which have been made since the year 1832, when Ritter's great work had been published, and the difficulty of treating them with the same details as Ritter had treated the scanty information available sixty years ago, have resulted in many delays in the appearance of the promised volumes, and even this last one comes out as the work of three different persons—P. P. Semenoff taking it up when Chersky had met with an untimely death in the far north of Siberia. But in the hands of P. P. Semenoff, the volume we now have before us bears no traces of an incomplete posthumous publication. On the contrary, it is a well-finished work, worthy to take one of the first places among the several excellent volumes of "Russian Addenda" previously published.

Not only the great lines of Ritter's classical work and its spirit could be fully maintained, but the many explorations which have been made in this region during the last sixty years, have only confirmed the correctness of the conceptions of the great geographer. The Sayan mountains appear, indeed, as a huge border-wall of the great massive upheaval of North-west Mongolia, and as a part of the immense border-ridges which fringe the high plateau of East Central Asia. And in the Alpine regions beyond it there is no trace of the chains which Humboldt wanted to run along the parallels, and the meridians. There is, in the Tunka, the Kitoi, and the Byelaya Alps, simply a succession of chains running roughly parallel to the border-ridge.

In the huge border-ridge lies the 11,500 feet high Munku Sardyk, the highest mountain of East Siberia, which till lately was supposed to be the only one snow-clad peak in that part of Asia. Its glaciers and its summit had already been visited and described by Radde in 1856, but the present volume contains also the most interesting observations of Captain Bobyr, who has revisited the peak, and from whom we learn that four more peaks rise above the snow-line in the same part of the

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[1] This expression occurs over thirty times.

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Sayans. One of them, situated further west and named Peak Middendorff, gives origin to mighty glaciers, visited by M. Yachevsky. The same expedition has fully confirmed the fact which was much contested five-and-twenty years ago, namely, that the highlands lying in the south of the Sayans are a plateau, 3000 to 4000 feet high, belonging to the great plateau of East Asia.

However, much remains to be done to explore the border-wall of this plateau, for, apart from the exploration of the Munku Sardyk and the plateau in the south of it, by Captain Bobyr, little has been added to what was known thirty years ago from the rapid excursions of Radde, Polyakoff, and the writer of these lines. The ridge offers, however, a good deal of interest in more than one aspect. It gave rise, probably, in the early Quatenary period, to mighty flows of lava, which spread down the valleys of its northern slope, reaching the valley of the Irkut; and, in the valley of one of the tributaries of the Upper Oka, the Junbulak, two small craters of ejection, 400 feet high, were described in 1864. Unhappily, these formations, so interesting in the very heart of Asia, at an altitude of about 6200 feet, have not been revisited since, and all we know about them is what could be gathered during a rapid excursion.

The beautiful valley of the Irkut, between the Sayans in the south, and the wild stony wall of the Tunka Alps in the north, is described next, and a masterly perusal of the available documents gives a very lively picture of that broad valley, covered with lacustrine deposits, and, about the Tunka village, with sheets of lava. But with the mountains in the north of this valley one enters again in a field nearly quite unbroken by the explorer. Happily enough, Chersky has crossed it in at least one direction, and some of the most interesting parts of the present volume are those given to the description of these mountains, among which the Munku Sagan Khardyk—snow-clad, as its very name shows—reaches to the unsuspected height of nearly 10,000 feet. The description is the more interesting, as it is based upon Chersky's unpublished MS. notes, and it is sufficiently detailed to give a good idea of that part of the immense Alpine region stretching in the north of the Irkut. Further west, the footpath which leads to the long since abandoned graphite mines of Mount Alibert, and which has been followed by several geographers, as also further east, this grand mountain region, rising to 7000 and up to 9000 feet above the sea-level, continues to remain totally unknown. Even the river valleys of the Kitoi and the Byelaya are only mapped in their lower courses.

The 1500 to 2000 feet high plains which lie in the north of this Alpine region, and which will soon be intersected by the great Sibetian railway, come next. These fertile plains are well explored by this time, and their climate, soil, and flora are fully described; especially the flora, for which we have the excellent works of MM. Agapitoff, Prein, and J. Freyn (plants gathered by Ferd. Karo), so that we not only possess lists of plants, but know their distribution and subdivision into vegetable "formations," the whole making a capital addition to the classical work of Turchaninoff.

And, finally, the volume contains a full geographical and statistical description of the regions occupied by both the Russian and the Buryate settlements on the high plains along and on both sides of the present Siberian highway.

In the appendix the description of the Nizhneudinsk caves, explored by Chersky, is especially interesting for the naturalist; the more so as Chersky's report had only been published in Russian, in the little-known publications of the East Siberian Geographical Society, and his collection of bones was destroyed during the great Irkutsk conflagration. These caves, situated in limestones 700 feet above the level of the Uda River, and attaining a total length of 1525 feet, contain immense quantities of relics of all sorts of mammals, 17 feet thick at certain places. Moreover, in consequence of the low temperature which prevails in the caves, the bones of the animals are sometimes found with perfectly well-preserved pieces of cartilages, muscles, and skin attached to them. The species discovered by Chersky were:—*Vespertilio borealis* and another still living species of bat; *Sorex vulgaris; Canis Nischneudinensis*, a species of wild dog, analogous to, but separate from, the *Canis alpinus*, which may still exist in the mountains of the above Alpine region; the Arctic fox (*Canis lagopus*) and the common fox (*C. vulpes*); the common bear, the *Gulo borealis*, and the sable; a species of *Spermophilus*, different from both the *S. Eversmanii* and the *S. Perryi* which exist in north-east Siberia (its samples have perished during the Irkutsk conflagration); several *Arvicolæ;* the lemming, probably *Myodes obensis*, various soft parts of the head and fore-feet being well preserved with the bones; *Lepus variabilis, Lagomys hyperboreus, Cervus tarandus*, and *Antilope saiga* (named *Antilope borealis* by Chersky); an undetermined species of *Capra*, the horse, and, what was most striking, a piece of the skin of a rhinoceros. This find was so extraordinary that Chersky hesitated to consider it as a rhinoceros skin, and mentioned it in his report as *Sus?* And so it appears also in Count Uvaroff's "Anthropology" But this piece had happily been sent to St. Petersburg before the conflagration took place, and on nearer examination it at once was recognised as having belonged to a rhinoceros, on account of its characteristic oval pits filled with clusters of seven to ten, and even thirty-three hairs in each cluster. The mixed fauna of the caves proves that they have been filled with animal remains since the Glacial period, and possibly it also points out (through the *Saiga* remains) to a relatively warm post-Glacial period. It is evident, at any rate, that a new exploration of the Nizhneudinsk caves would prove of great utility for post-Glacial palæontology.

The foregoing rapid sketch gives an idea of the interesting contents of this volume. The very name of P. P. Semenoff is itself a guarantee for a thoroughly scientific and good all-round use having been made of all the available materials, without falling into the lengths and repetitions which one would readily excuse in a work of this kind, if they existed. The whole is a lively description of the region, with a view to the grand lines of structure, combined with minutest accuracy in even small details. It would certainly be a great regret if this volume, like the preceding ones of the Russian addenda to Ritter's "Asia" (Amur, East Turkestan, West Sayans) were to remain accessible to Russian geographers only.

P. K.

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